Lab Assignment 7

(Due: your class day of **Nov 10**)

In this lab, you will be able to practice the firewall commands using iptables and see its effect. The iptables rule is specified using the following format

iptables -t TABLE_NAME -A Chain_name several_conditions -j action

Its means that in **chain** *Chain_name* of **table** *TABLE_NAME*, the rule below will be appended:

if *several_conditions* is satisfied, then *action* will be taken.

Here **adding** the rule is specified by –A. You can also change to -D for **deletion** or –I for **insertion** (at somewhere of the chain). If -t does not occur, the default table **filter** is assumed.

Note 1: for each problem, write details and use the screenshot as evidence (for your solution). If there is no question there, explain the rule and give screenshot to show what happens if the rule is executed.

Note 2: In the following, we use sudo to show the root privilege. But if we use docker-compose to simulate VMs, VM might automatically have the root privilege and so **sudo** is not needed.

Note 3: In our docker-compose, we simulate two networks: **10.9.0.0/24** (hosts: 10.9.0.5, 10.9.0.11) and **192.168.60.0/24** (hosts: 192.168.60.5, 192.168.60.6, 192.168.60.7, 192.168.60.11), where 10.9.0.11 and 192.168.60.11 belong to **router**. You can use command **route** to see the routing table on each VM.

Note 4. All firewall rules are run on **router** VM.

1. Use the following commands on **router** to set the default policies for a table**.**

sudo iptables –P INPUT ACCEPT

sudo iptables –P OUTPUT ACCEPT

sudo iptables –P FORWARD DROP

Recall, INPUT is to check incoming packet; OUTPUT is to check outgoing packet; FORWARDING is to check the passing packet (at router). Further, the commands assume the default table **filter (-t filter)**.

- On 192.168.60.6, run **$ ping 10.9.0.5** and then ping 192.168.60.11. Does it succeed? Explain your observation.
- Change **DROP** to **ACCEPT,** for FORWARD case. Try the pings in the above step again. Now does it succeed?

2. [**blocking an IP**]

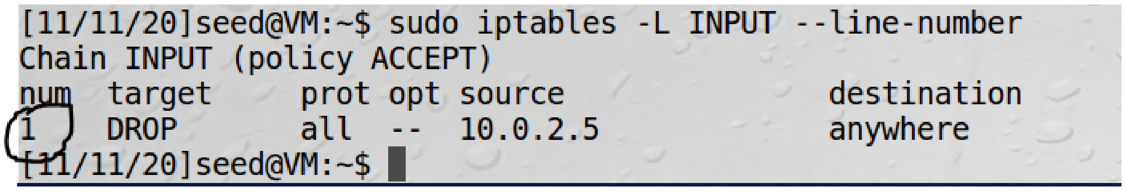
- On 192.168.60.11, if we want to block packets **from** an ip address IP1, use command
  sudo iptables -A INPUT -s IP1 -j DROP
  /*this uses INPUT chain because it is incoming packet***/**
  On IP1, ping 192.168.60.11 and what can be observed? Explain.
- On 192.168.60.11, if we want to block packets **to** an ip address IP1, use command
  sudo iptables -A OUTPUT -d IP1 -j DROP
  /*this uses OUTPUT chain because it is outgoing packet***/**
  On 192.168.60.11, ping IP1 and what can be observed? Explain.

3. [List all rules] do it on Router.

- You can see all the firewall rules by the following command
  $ sudo iptables -L
  /* again, this assume filter table (i.e., **-t filter**) by default*/
- You can see all the fire rules in each chain with index number. The index will be used for other operation such as deletion later.
  $ sudo iptables -L --line-number

4. [Delete a rule] on **Router,** delete a rule in a chain (such as INPUT) in two steps:
first, list with index:

$ sudo iptables –L INPUT --line-number



```
[11/11/20]seed@VM:~$ sudo iptables -L INPUT --line-number
Chain INPUT (policy ACCEPT)
num  target     prot opt source               destination
1    DROP       all  --  10.0.2.5             anywhere
[11/11/20]seed@VM:~$ 
```

Then, delete the rule using the index:

$sudo iptables -D INPUT 1

Now use the method to delete the first rule in your current INPUT table and then **$ sudo iptables -L INPUT** to verify whether rule 1 is deleted or not.

5.[Delete all rules in a TABLE] On **router,** flush the rules in a table (e.g., **filter**):

$sudo iptables -t filter -F

/*again,**-t filter** can be omitted*/

Then, run **$sudo iptables -L** and you will not see any rule.

6 [**Drop all incoming connections, except telnet**] On **router**, block incoming connections to any service except for telnet. To do this, we can set default policy for INPUT chain of filter Table to be DROP and then specify a rule to accept incoming telnet connection.
$ sudo iptables -P INPUT DROP
$ sudo iptables -A INPUT -p tcp - -dport 23 -j ACCEPT

/* A default policy is applied only if all the rules in the chain have been executed without making a decision (either ACCEPT or DROP or REJECT). For example, if we ssh to router, then the rule does not ACCEPT but also not REJECT. So the default policy applies. Note: here **-p** stands for protocol. */
Then, ping and telnet to 192.168.60.11 (from other VM). Which succeeds (telnet or ping)?

/*after this problem, run **$ sudo iptables -F** to flush all rules in **filter** table and recover the default policy: **$ sudo iptables -P INPUT ACCEPT** */

7 [**drop outgoing DNS request to 8.8.8.8**] In this case, since it is outgoing packet, we add rule to OUTPUT chain. Since it is DNS request, the destination should be the DNS server, which has a port number 53. Finally, since DNS is implemented using UDP, we use protocol UDP. Hence, we add the following rule:

```
$ sudo  iptables   -A  OUTPUT   -p udp   - - dport 53   -d 8.8.8.8   -j DROP
```

Then, try **$ dig** www.uwindsor.ca and **dig @8.8.8.8** www.uwindsor.ca. Which succeeds?
/* delete the rule in order not to affect the following experiment */

8 [**block incoming ping request**] You can not ping uwindsor webserver. Most likely, this is blocked by firewall of uwindsor. Here is the way to block an incoming icmp request.

```
$ sudo iptables -A INPUT -p icmp --icmp-type echo-request -j DROP
```

Run this on **router** and ping router from another VM. Do you get any reply? Explain.

9. Suppose that you want to block all incoming connections while you do not want your visit to external servers to be affected. However, if you send a request to an external server, the server will reply to you while this packet will be blocked by your firewall. To resolve this issue, you should regard the response packet (to your request) as related to your outgoing request packet and allowed to come in. This is achieved using the *conntrack* module.

```
$ sudo iptables   -P INPUT   DROP
$ sudo iptables   -A  INPUT  -p tcp   -m conntrack   --ctstate RELATED, ESTABLISHED   -j ACCEPT
```

Try this on **router** VM. Then, telnet to a VM (e.g. 192.168.60.7).
Next, telnet from the latter (192.168.60.7) to **router**. Which telnet session directly succeeds?

10 (optional) [save your firewall rules and restore it] After you have done firewall, you want to save your rules to a file you can run

```
$ sudo iptables-save >myiptables.rules
```

Later, you can restore your rules by running

```
$ sudo iptables-restore <myiptables.rules
```

/* to see the effect, you can flush your firewall after running iptables-save command and then run iptables-restore command to see if you have restored your firewall */